

As an overview to the present reply, Applicant notes that on the Notice of References Cited (Form PTO-892), it is indicated that the "Bertrand patent" is identified by document number WO 97/30183. This is the International Publication that was provided with the Official Action. However, on the International Publication provided with the Official Action, there is no mention of the name "Bertrand". However, in the text of the Official Action, the "Bertrand" patent is identified as International Publication No. WO009905732A1. This is different than the International Publication provided with the Official Action. Applicant's attorney is somewhat confused as to which is the intended reference. Applicant's attorney is relying upon the reference included with the Official Action, i.e. International Publication No. WO 97/30183. Applicant's attorney respectfully requests that the Examiner review the Official Action so as to correct for this inconsistency, if necessary.

Applicant respectfully contends that the silver concentration is "non-obvious" at the ranges mentioned in the original application. Applicant notes that there was no mention of the use of a silver content of 0.006 - 0.010% in the Pb-Ca-Sn-Ba alloys was found in the various patents described in the prior art of the previous Official Action or in the "Bertrand" patent. Although it would superficially seem obvious that, by adding silver to the Pb-Ca-Sn-Ba-Al alloys, the corrosion resistance of the alloys would be improved, the suitable silver content has not been previously determined. The proper silver content must be chosen so as to achieve a suitable compromise between the corrosion and the mechanical properties of the alloy.

It was clearly mentioned in the original application on page 4, lines 9 - 22 through page 5, lines 1 - 9, the presence of silver in the casted grid made from Pb-Ca-Sn-Ag-Al alloys is associated with two main problems. First, silver requires that the alloy be given an age hardening treatment above room temperature (for approximately 8 hours at 80 - 100°C) in order to achieve the hardness

and strength required for the processing steps of the lead-acid battery manufacturing. Secondly, silver increases the tendency to the hot cracking of the Pb-Ca-Sn-Al-Ag alloys by increasing their freezing range.

It is well known that, at room temperatures, the Pb-Ca-Sn-Al family of alloys develops age hardening. However, the kinetics of this process are very slow. This leads to the temporary storage of grids so as to allow for the hardness phenomenon to take place. As a result, the use of a thermal treatment is unavoidable. This increases the production rates at the expense of an increment in the capital costs. Ultimately, the alloy's maximum hardness and strength must be achieved without sacrificing corrosion resistance in order to improve the overall battery quality. The alloy's corrosion resistance attributes are due to a uniform dispersion of very fine intermetallic precipitates in a lead-rich matrix. This results from the employment of proper thermal treatment conditions. As was stated on page 9, lines 3 - 10:

From an intensive research work, undertaken in our testing laboratories and in our pilot plant, it has been found that the grids and the batteries assembled with these grids can be further improved by the addition of a new alloying element to the Pb-Ca-Sn-Ag-Al alloy. One aspect of the present invention is oriented towards the improvements of barium additions to Pb-Ca-Sn-Ag-Al alloy that lead to modifications of the microstructure of this alloy during solidification in order to eliminate the age hardening treatment at temperatures higher than the room temperature required by conventional Pb-Ca-Sn-Ag-Al casting alloy before pasting and curing, while still retaining the creep corrosion resistance provided by the silver content of the alloy.

Thus, the alloy's composition was selected in such a way as to define a suitable calcium, tin, silver, aluminum, and barium content for optimum balance between the mechanical properties and the corrosion resistance, without the need for an age hardening treatment at high temperatures. Evidence

from these results has shown that the corrosion of battery grids is reduced, in comparison to Pb-Ca-Sn-Al-Ag and Pb-Ca-Sn-Al-Ba alloys, when the grids are made with Pb-Ca-Sn-Al-Ag-Ba alloys according to the present invention.

In the original specification, it was demonstrated that silver contents of lower than 0.006% resulted in an insufficient corrosion resistance. On the other hand, silver contents of greater than 0.010% resulted in poor mechanical properties of the alloy. This behavior was experimentally determined and was not obvious, in any way, from the reading of International Publication No. WO-97-30183. Ultimately, the Bertrand patent is silent as to the silver content in the range of the present invention.

In the original specification, it is recited on page 14, line 15 - 20 that:

The data of the previously described tests supports the view that batteries made with positive grids using the alloy of the present invention have improved hardening performance with respect to the silver without barium alloy, and improved corrosion performance with respect to the barium without silver alloy. The invented alloy delivers the best of the two performance parameters making possible not only to achieve better manufacturability for automobile batteries through a faster hardening alloy, but also to produce a battery which suffers less degradation over its useful life.

As such, as combined with the overall product, including the positive and negative grids identified in independent Claim 5, the present invention achieves advantages neither shown nor suggested by the prior art Bertrand patent. Ultimately, Applicant contends that the original specification does support the "non-obviousness" of the particular percentage of silver content in the alloy. There is nothing in the teachings of the prior art that would suggest, in any way, this percentage as utilized within the alloy nor the advantages achieved through the introduction of these percentages of alloy

into the other composition. As such, Applicant respectfully contends that the present invention, as defined by independent Claims 4 and 5, are non-obvious with respect to the prior art reference.

Based upon the foregoing analysis, Applicant contends that independent Claims 4 and 5 are now in proper condition for allowance. Reconsideration of the rejections and allowance of the present claims at an early date is earnestly solicited. Since no new claims have been added above those originally paid for, no additional fee is required.

Respectfully submitted,

8-12-03  
Date

  
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